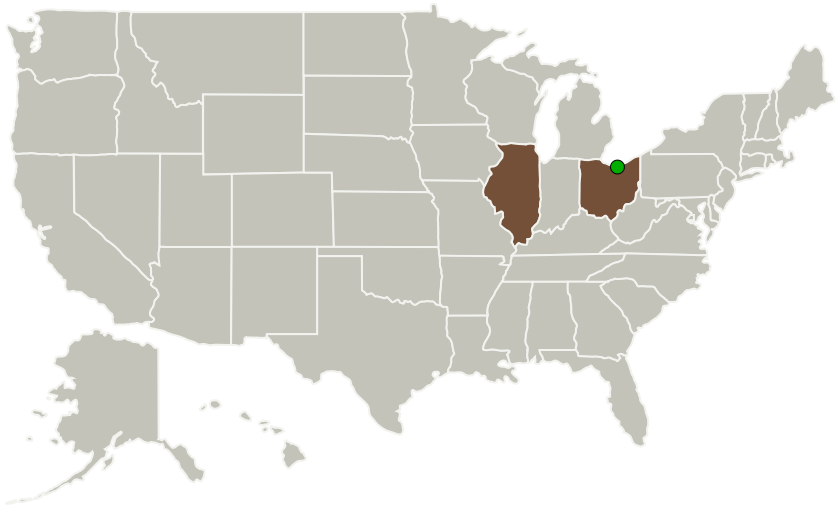
3D Nano-Epitaxial Lateral Overgrowth (nano-ELOG) of Large Area, Highly Efficient, and Flexible Multijunction Solar Cells for Space Applications, Phase I

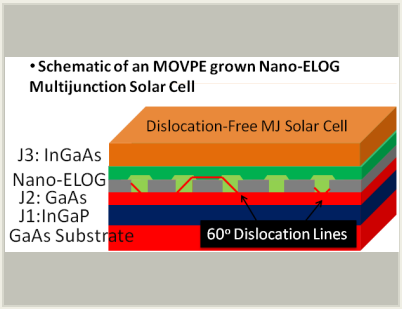
Completed Technology Project (2017 - 2017)

Project Introduction

By Epitaxial Lateral Overgrowth (ELOG) and Selective Area Growth (SAG) in nanometer scales, MicroLink Devices will develop the next generation of multijunction solar cells for Space applications. The proposed innovation is the first attempt to use advanced surface nano-engineering technologies to control the formation, propagation and annihilation mechanism of extended defects including dislocations in multijunction solar cells. There is significant gap between the theoretically calculated efficiency of multijunction solar cells and the experimental results. That efficiency gap increases with the increase of number of junctions/subcells. Misfit dislocations created due to high lattice mismatch between subcells play a major role in hampering the efficiency and reliability of such devices. A successful implementation of nano-ELOG in solar cells will results in 3J solar cells with significantly reduced dislocation density, resulting in an improved Voc and Isc and conversation efficiencies of the cells. Therefore, MLD can utilize this method to grow devices with increased number of junctions to reach practical efficiencies close to 40% (6J) from the current 30% (in commercially available 3J cells) in AM0 and 1sun conditions. It is important to explore, and consequently, take advantage of the latest nano-patterning developments for NASA's photovoltaic devices.

Primary U.S. Work Locations and Key Partners





3D Nano-Epitaxial Lateral Overgrowth (nano-ELOG) of Large Area, Highly Efficient, and Flexible Multijunction Solar Cells for Space Applications, Phase I Briefing Chart Image

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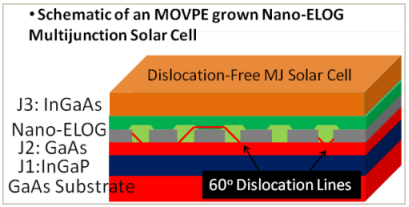
Organizations Performing Work	Role	Type	Location
MicroLink Devices, Inc.	Lead Organization	Industry Minority-Owned Business	Niles, Illinois
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Illinois	Ohio

Images



Briefing Chart Image
3D Nano-Epitaxial Lateral Overgrowth (nano-ELOG) of Large Area, Highly Efficient, and Flexible Multijunction Solar Cells for Space Applications, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/126907)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
MicroLink Devices, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

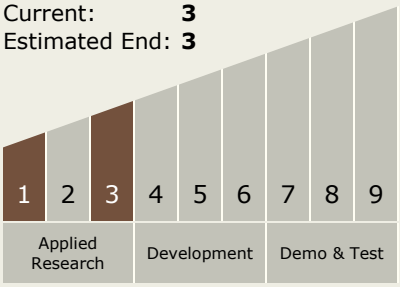
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Kamran Forghani

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.1 Power Generation and Energy Conversion
    - TX03.1.1 Photovoltaic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System